

National 5 Tutorials

Properties of straight line segments

In this unit a system of co-ordinates is described, and is used to find various properties of the straight line between two points. The distance between the two points and the mid-point of the line joining the two points are calculated.

Video tutorial 27 mins.

http://www.mathtutor.ac.uk/geometry_vectors/propertiesofstraightlinesegments

The gradient of a straight line segment

In this unit the gradient of a straight line segment is found, and the relationships between the gradients of parallel lines and perpendicular lines are explained.

Video tutorial 21 mins.

http://www.mathtutor.ac.uk/geometry_vectors/thegradientofastraightlinesegment

Equations of straight lines (with extension)

In this unit the equation of a straight line is established using either information about its gradient together with the co-ordinates of a point on the line, or alternatively the co-ordinates of two different points on the line. The different ways of expressing the final equation are explored.

Video tutorial 34 mins.

http://www.mathtutor.ac.uk/geometry_vectors/equationsofstraightlines

Powers or indices

A knowledge of powers, or indices as they are often called, is essential for an understanding of most algebraic processes. In this section you will learn about powers and rules for manipulating them through a number of worked examples.

Video tutorial 33 mins.

<http://www.mathtutor.ac.uk/algebra/powersorindecies>

Surds

Roots and powers are closely related, but only some roots can be written as whole numbers. Surds are roots which cannot be written in this way.

Video tutorial 33 mins.

<http://www.mathtutor.ac.uk/arithmetic/surds>

Mathematical Language

This introductory section provides useful background material on the importance of symbols in mathematical work. It describes conventions used by mathematicians, engineers, and scientists.

Video tutorial 22 mins.

<http://www.mathtutor.ac.uk/algebra/mathematicallanguage>

Substitution And Formulae

In mathematics, engineering and science, formulae are used to relate physical quantities to each other. They provide rules so that if we know the values of certain quantities; we can calculate the values of others. In this unit we discuss several formulae and illustrate how they are used.

Video tutorial 21 mins.

<http://www.mathtutor.ac.uk/algebra/substitutionandformulae>

Expanding And Removing Brackets

In this unit we see how to expand an expression containing brackets. By this we mean to rewrite the expression in an equivalent form without any brackets in. Fluency with this sort of algebraic manipulation is an essential skill which is vital for further

study.

Video tutorial 40 mins.

<http://www.mathtutor.ac.uk/algebra/expandingandremovingbrackets>

Factorising Quadratics

An essential skill in many applications is the ability to factorise quadratic expressions. In this unit you will see that this can be thought of as reversing the process used to 'remove' or 'multiply-out' brackets from an expression.

Video tutorial 43 mins.

<http://www.mathtutor.ac.uk/algebra/factorisingquadratics>

Completing The Square

Completing the square is an algebraic technique which has several applications. These include the solution of quadratic equations. In this unit we use it to find the maximum or minimum values of quadratic functions.

Video tutorial 20 mins.

<http://www.mathtutor.ac.uk/algebra/completingthesquare>

Simplifying Algebraic Fractions

The ability to simplify fractions and to write them in equivalent forms is an essential mathematical skill required of all engineers and physical scientists. This unit explains how these processes are carried out.

Video tutorial 18 mins.

<http://www.mathtutor.ac.uk/algebra/simplifyingalgebraicfractions>

Linear Equations in one variable

In this unit we give examples of simple linear equations and show you how these can be solved. In any equation there is an unknown quantity, x say, that we are trying to find. In a linear equation this unknown quantity will appear only as a multiple of x , and not as a function of x such as x^2 , x^3 , $\sin x$ and so on. Linear equations occur so frequently in the solution of other problems that a thorough understanding of them is essential.

Video tutorial 34 mins.

<http://www.mathtutor.ac.uk/algebra/linearequationsinonevariable>

Solving Inequalities

Inequalities are mathematical expressions involving the symbols $>$, $<$, \geq and \leq . To 'solve' an inequality means to find a range, or ranges, of values that an unknown x can take and still satisfy the inequality.

Video tutorial 27 mins.

<http://www.mathtutor.ac.uk/algebra/solvinginequalities>

Transposition of Formulae

It is often useful to rearrange, or transpose, a formula in order to write it in a different, but equivalent form. This unit explains the procedure for doing this.

Video tutorial 39 mins.

<http://www.mathtutor.ac.uk/algebra/transpositionofformulae>

Introduction to functions (with Extension)

A function is a rule which operates on one number to give another number. However, not every rule describes a valid function. This unit also introduces some of the mathematical terms associated with functions.

Video tutorial 32 mins.

<http://www.mathtutor.ac.uk/functions/introductiontofunctions>

Linear functions

Some of the most important functions are linear. This unit describes how to recognize a linear function and how to find the slope and the y -intercept of its graph.

Video tutorial 19 mins.

<http://www.mathtutor.ac.uk/functions/linearfunctions>

Pythagoras' Theorem

Pythagoras' theorem - the square on the hypotenuse is equal to the sum of the squares on the other two sides

- is well known. In this tutorial we revise the theorem and use it to solve problems in right-angled triangles. A less familiar form of the theorem is also considered.

Video tutorial 26 mins.

<http://www.mathtutor.ac.uk/trigonometry/pythagorastheorem>

Trig ratios in a right-angled triangle

Knowledge of the trigonometric ratios of sine, cosine and tangent is vital in very many fields of engineering, science and maths. This unit introduces them and provides examples of how they can be used to solve problems.

Video tutorial 35 mins.

<http://www.mathtutor.ac.uk/trigonometry/trigratiosinarightangledtriangle>

Trig ratios of an angle of any size

Knowledge of the trigonometric ratios sine, cosine and tangent is vital in many fields of engineering, maths and science. This unit explains how the sine, cosine and tangent of an arbitrarily sized angle can be found.

Video tutorial 28 mins.

<http://www.mathtutor.ac.uk/trigonometry/trigratiosofanangleofanysize>

Simultaneous Linear Equations

The purpose of this section is to look at the solution of simultaneous linear equations. We will see that solving a pair of simultaneous equations is equivalent to finding the location of the point of intersection of two straight lines.

Video tutorial 35 mins.

<http://www.mathtutor.ac.uk/algebra/simultaneouslinearequations>

Completing The Square Maxima And Minima

In this unit we consider how quadratic expressions can be written in an equivalent form using the technique known as completing the square. This technique has applications in a number of areas, but we will see an example of its use in solving a quadratic equation.

Video tutorial 18 mins.

<http://www.mathtutor.ac.uk/algebra/completingthesquaremaximaandminima>

Quadratic Equations

This unit is about the solution of quadratic equations. These take the form $ax^2+bx+c=0$. We will look at four methods: solution by factorisation, solution by completing the square, solution using a formula, and solution using graphs.

Video tutorial 51 mins.

<http://www.mathtutor.ac.uk/algebra/quadraticicequations>

Triangle formulae

A common mathematical problem is to find the angles or lengths of the sides of a triangle when some, but not all, of these quantities are known. It is also useful to be able to calculate the area of a triangle from some of this information.

Video tutorial 40 mins.

<http://www.mathtutor.ac.uk/trigonometry/triangleformulae>